

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

- 5 1. A radio frequency communication system for communicating radio frequency data signals containing data to and from remotely located data devices, said system comprising:

a radiating transmission line;

- 10 a head end unit comprising a system server, said head end unit being coupled to a first end of the radiating transmission line;

- at least one regeneration amplifier connected to said transmission line for amplifying the data signals by demodulating the data signals to recover the data contained therein and modulating the recovered data into a regenerated radio frequency data signal containing the recovered data;

- 15 wherein the regenerated data signal is transmitted through the radiating transmission line at a power level permitting transmission and radiation of the regenerated radio frequency data signal to the remotely located data devices within a coverage area of the regeneration amplifier.

2. The system as defined in claim 1 wherein the
25 regeneration amplifier comprises:

a demodulator for demodulating the data signals to recover the data contained therein;

- a modulator for modulating the recovered data into a regenerated radio frequency data signal containing the
30 recovered data;

a processor connected to the modulator and demodulator for receiving the recovered data from the demodulator and performing error detection and correction functions on the recovered data prior to modulating the recovered data.

3. The communication system as defined in claim 2 wherein the regeneration amplifier further comprises:

a device for tracking the data devices within the coverage area of the regeneration amplifier;

wherein the regeneration amplifier periodically transmits information regarding the data devices within its coverage area to the system server of the base unit to permit the system server to account for delays resulting from the regeneration amplifiers.

4. The communication system as defined in claim 3 wherein each data device in the communication system has a unique address which can be transmitted through the communication system to the regeneration amplifiers;

wherein the device for tracking the data devices monitors the unique addresses being transmitted by data devices to track the data devices within the coverage area; and

wherein the device to track the data devices periodically transmits the unique addresses of the data devices within the coverage area to the system server to permit the system server to account for delays caused by the regeneration amplifier.

5. The communication system as defined in claim 3 wherein the system server determines a number of regenerations required for a data signal to reach a target data device and for an acknowledgement signal to be received by the system server so that the system server can account for delays caused by each regeneration amplifier when sending radio frequency data signals through the radiating transmission line and awaiting an acknowledgement signal from the data device to which the radio frequency data signals were sent.

6. The communication system as defined in claim 5 wherein the system server comprises a topology of the system and the system server accounts for delays caused by each regeneration by determining the location of the target data device in the topology and calculating the number of regenerations required to send a data signal to the target device and receive an acknowledgement.

7. The communication system as defined in claim 5 wherein the data signals have a frequency of between 2 MHz and 200 MHz and a bandwidth of 0.5 MHz to 32 MHz.

8. The communication system as defined in claim 5 wherein the system server accounts for delays in sending data signals and receiving acknowledgement signals so as to comply with DOCSIS.

9. The communication system as defined in claim 1 wherein the head end unit transmits data signals to the

radiating transmission line at a first frequency and receives data signals from the radiating transmission line at a second frequency;

wherein the demodulator of each regeneration amplifier comprises a first demodulator for demodulating the radio frequency data signals at the first frequency travelling from the system server, and, a second demodulator for demodulating the data signals at the second frequency travelling towards the system server; and

wherein said modulator comprises a first modulator for modulating the recovered data of data signals travelling from the system server into a first regenerated radio frequency data signal having the first frequency and a power level permitting transmission and radiation of the first regenerated radio frequency data signal, and, a second modulator for modulating the recovered data from data signals travelling towards the system server into a second regenerated radio frequency data signal having the second frequency and a power level permitting transmission of the second regenerated radio frequency data signal.

10. The communication system as defined in claim 1 further comprising:

at least one linear amplifier connected to said radiating transmission line for amplifying data signals by filtering the data signals and then amplifying the data signals in a direction of travel.

11. In a radio frequency communication system for communicating radio frequency data signals containing data to

and from remotely located data devices through a radiating transmission line, a regeneration amplifier for amplifying the digital signals through the radiating transmission line, said regeneration amplifier comprising:

5 a demodulator for demodulating the data signals to recover the data contained therein;

 a modulator for modulating the recovered data into a regenerated radio frequency data signal containing the recovered data;

10 an amplifier for amplifying the regenerated data signal for transmission through the radiating transmission line at a power level permitting transmission and radiation of the regenerated radio frequency data signal to the remotely located data devices within a coverage area of the
15 regeneration amplifier.

12. The regeneration amplifier as defined in claim 11 further comprising:

 a processor connected to the modulator and
20 demodulator for receiving said recovered data from the demodulator and performing error detection and correction functions on said recovered data prior to modulating the recovered data.

25 13. The regeneration amplifier as defined in claim 12 further comprising a device for tracking the data devices within the coverage area of the regeneration amplifier; and

 wherein the regeneration amplifier periodically transmits information regarding the data devices within the
30 coverage area to a system server to permit the system server

to account for delays caused by the demodulator, the error detection and correction functions of the processor, and the modulator.

5 14. The regeneration amplifier as defined in claim 13 wherein each data device in the communication system has a unique address which can be transmitted through the communication system to the regeneration amplifier;

10 wherein the device for tracking the data devices monitors the unique addresses being transmitted by data devices to track the data devices within the coverage area; and

15 wherein the device to track the data devices periodically transmits the unique addresses of the data devices within the coverage area of the regeneration amplifier to the system server to permit the system server to account for delays caused by the regeneration amplifier.

20 15. The regeneration amplifier as defined in claim 14 wherein each regeneration amplifier within the communication system has a unique address; and wherein the device for tracking the data devices within the coverage area of the regeneration amplifier periodically sends a control signal to the system server containing the unique address of the
25 regeneration amplifier and the unique address of each data device within the coverage area of the regeneration amplifier.

16. The regeneration amplifier as defined in claim 15 wherein the information regarding the devices within the coverage area of each regeneration amplifier is sent to the system server, so that the system server can determine a number of regenerations required for a data signal to reach a target data device and for an acknowledgement signal to be received by the system server from the target device to permit the system server to account for delays caused by the regeneration amplifiers.

17. The regeneration amplifier as defined in claim 13 wherein the radio frequency communication system comprises a head end unit located at a first end of the radiating transmission line, said head end unit being associated with the system server for transmitting data signals to the transmission lines at a first frequency and for receiving the data signals from the radiating transmission line at a second frequency.

18. The regeneration amplifier as defined in claim 13 wherein the demodulator comprises a first demodulator for demodulating the radio frequency data signals at the first frequency travelling from the system server, and, a second demodulator for demodulating the data signals at the second frequency travelling towards the system server; and

wherein said modulator comprises a first modulator for modulating the recovered data of data signals travelling from the system server into a first regenerated radio frequency data signal having the first frequency and a power level permitting transmission and radiation of the first

regenerated radio frequency data signal, and, a second modulator for modulating the recovered data from data signals travelling towards the system server into a second regenerated radio frequency data signal having the second frequency and a power level permitting transmission of the second regenerated radio frequency data signal.

19. The regeneration amplifier as defined in claim 18 further comprising first bandpass filters connected between the first demodulator and the radiating transmission line and between the first modulator and the radiating transmission line for filtering the first data signals at the first frequency; and

second bandpass filters connected between the second demodulator and the radiating transmission line and between the second modulator and the radiating transmission line for filtering the second data signals at the second frequency.

20. The regeneration amplifier as defined in claim 19 wherein the first radio frequency data signals have a first bandwidth between 0.5 MHz and 32 MHz and the first bandpass filters filter data signals have the first bandwidth at the first frequency.

21. The regeneration amplifier as defined in claim 20 wherein the communication system communicates narrow band signals having a bandwidth of between 10 KHz and 100 KHz at a third frequency travelling away from the head end unit and at a fourth frequency travelling towards the head end unit;

wherein the regeneration amplifier further comprises linear amplifiers for amplifying the narrow band frequencies away from the head end unit at the third frequency and towards the head end unit at the fourth frequency; and

wherein the regeneration amplifier further comprises third filters located between the linear amplifier and the radiating transmission line for filtering narrow band data signals having the third frequency and fourth filters located between the linear amplifier and the radiating transmission line for filtering narrow band data signals having the fourth frequency.

22. The system as defined in claim 9 wherein the remotely data devices comprise a transceiver for receiving the first regenerated radio frequency data signal radiated by radiating transmission line and for transmitting the second radio frequency data signal to the radiating transmission line.

23. The system as defined in claim 9 wherein the remotely data devices can releasably connect to an interface connected to the radiating transmission for receiving the first regenerated radio frequency data signal from the radiating transmission line and for sending the second radio frequency data signal to the radiating transmission line.